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ABSTRACT

From the earliest of times, humans have been working to improve their world. Myths and misunderstandings have arisen from the rapid pace and increasing impact of technology on people's lives. This technology may be material, consisting of tangible implements, or nonmaterial, consisting of both knowledge processed and methods that help humans perform better. Other classifications of technology are high technology, usually characterized by significant science or engineering content, or low technology, which tends to have lesser unit cost and more human involvement. Technological awareness and understanding constitute an area where communication plays a vital role. The most important issue of all is to make a conscious decision on how to view technology, to recognize its existence in all eras of history, and to assimilate it with society's value structure. (DF)

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CLARIFYING TECHNOLOGY: ITS LANGUAGE AND USE

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ABSTRACT

The subject of technology is widely used today, but often misunderstood. Technology has been with us for the life of humankind but is becoming very complicated today in providing tools and options to society. Various dimensions and characteristics of technology are explained as they bear on the ways that human capabilities are extended by use of technology. Technology is viewed as neither good nor bad, but subject to the ways in which one uses technology, along with the consequences of that use.

INTRODUCTION

To paraphrase some classic poetry, "technology is too much about us, soon and late . . . ." Technology is variously viewed as a saviour, threat, boon, or curse to mankind. High technology is presented as the ultimate of technology in what is offered to humans to deal with the problems of today and tomorrow.

This paper deals with the language of technology and the related concepts that touch on people living their lives in organizations which attempt to cope with the technological environment. The operating premise is that to deal effectively with technology, one must understand the concept and language of technology. With this understanding one can communicate in ways that will manage technology, rather than have technology manage people.

This material will be presented in sections that address three key questions:

1. What is technology?

2. What is high technology?

3. Can technology be managed?

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WHAT IS TECHNOLOGY?

Table I presents an array of definitions of technology. The authors include philosophers, social scientists, engineers, and economists. The common thread is the means by which mankind finds ways to modify the environment to achieve something useful.

Table I. Definitions of Technology

- The organization and application of knowledge for the achievement of practical purposes. It includes physical manifestations such as tools and machines, but also intellectual techniques and processes used in solving problems and obtaining desired outcomes.
  Kast & Rosenzweig (1979)

- The science of applying information and knowledge to problem-solving situations. Boone & Kurtz (1981)

- The means by which an organization transforms inputs into outputs.
  Bedeian (1980)

- Knowhow.
  Drucker (1970)

- Any set of standardized repeatable operations that regularly yield predetermined results. Freeman (1974)

- The totality of methods rationally arrived at and having absolute efficiency in every field of human activity.
  Ellul (1964)

- That set of processes, tools, methods, procedures, and equipment which are used to produce goods or services.
  Schroeder (1981)

- The means of transforming raw materials, people, information, and physical materials into desirable goods and services.
  Perrow (1970)

- The systematic application of scientific or other organized knowledge to practical tasks. Galbraith (1967)

- The process of applying science and knowledge to the affairs of man, especially in transformations, processes, and products used to solve problems. Luchsinger (1983)

Technology comes from the Greek technika which means tool. When one looks at technology, one looks at the history of human development--mankind and tools. Technology provides the options to make better decisions and the tools to improve processes and products.

From the earliest of times, humans have been working to improve their world. The wheel became the "new" technology of the Stone Age; the printing press, the image of the future for the Middle Ages. The present society is called high-tech society, but if one looks at other ages, would they also have considered themselves "high-tech"--meaning those "newfangled gadgets that are changing our lives"?

Technology is not good or bad--it is neutral. Its use by people determines its positive or negative nature. Fire, paper, electricity and buttons are all technologies that have improved life.. The clock has been cited as a major device to help bring order, promptness, and some forms of urgency. The clock helps one to be on time but also shows how late one may be in completing a task. Fire warms, yet it burns. Buttons bind clothing together but also break. Bulbs bring light, then burn out. Paper holds the written word but can be smeared. The basic product's use and interpretation are controlled by people.

Perhaps part of the reluctance of accepting technology is that the pace of technology has quickened over time. This acceleration has seriously affected the ability to communicate in interpersonal and organizational settings. This pace can be dramatically portrayed by comparing the 240,000 years of mankind's existence on earth to one hour of time. Fifty-five minutes of that hour are spent in Paleolithic (Old Stone Age) culture. Then:

> Five minutes ago [the Stone Age man] embarked upon the neolithic culture in the cultivation of plants, the domestication of animals, the making of pottery, weaving, and the use of the bow and arrow; 3.5 minutes ago he began the working of copper; 2.5 minutes ago he began to mold bronze; 2 minutes ago he learned to smelt iron; 1/4 minute ago he learned printing; 5 seconds ago the Industrial Revolution began; 3.3 seconds ago he learned to apply electricity; and the time he has had the automobile is less than the interval between the ticks of a watch, i.e., less than one second. (Wallis, 1962, p. 10)

Many myths and misunderstandings have arisen from the rapid pace and increasing impact of technology on people's lives. Freeman (1974) has characterized some of these impacts as

1. Vast power to alter society and affect the environment (as with television, nuclear power and the automobile).

2. Diminishing lead times between initial technological innovation and application, leaving less time for adjustment.

3. Technology having impact on a human population of increasing size, diversity, and differentiation.

4. Increasing concern for decisions to be made with some participation by those affected.

All the preceding concerns highlight the increasing demands placed upon the communication process for influencing innovation, making decisions, and dealing with the effects of these decisions. Further elaboration of the nature of technology for purposes of articulating implications for communication follows.

The definitions in Table I carry implication of process and/or product concern. This discussion will attempt to honor both. For instance, technology could be separated into material and nonmaterial sectors.

1. Material Technology consists of tangible implements, tools, devices, and equipment that extend human ability to deal with the physical environment. This technology is usually derived from scientific or engineering applications. Examples are computers, television, telephones, and digital watches.

2. Nonmaterial Technology consists of the knowledge, processes, and methods that help humans perform better. This technology derives from practice, experience, insight, and the research on improvements and practices. This includes speedreading, double-entry bookkeeping, writing courses, and communication audits.

All things considered, technology extends capability by providing tools and knowhow to help mankind enjoy more options or improved ability to perform. Technology is found in administration, organization, engineering, agriculture, and communication. Interestingly, while technology has vastly improved the capability to communicate, the complex and pervasive impact of technology in the environment keeps threatening the net effectiveness of man's communication.

WHAT IS HIGH TECHNOLOGY?

In addition to the material versus nonmaterial nature of technology, another dimension leaps from the realities of life today. "High-tech" is a label attached to many products and processes of our environment that have an aura of science, exotic and complicated natures, and vague mystery. High technology is characterized by

a. Significant science or engineering content.
b. Technical rigor.
c. Usually a high unit cost.
d. Less human involvement.
e. General material, tangible nature.

Low technologies are characterized by

a. More established or procedural basis.
b. Orientation to operations.
c. Lesser unit cost.
d. More human involvement.
e. Application and derivation; often nonmaterial.

High technology includes integrated circuits, solar panels, fiber-optics, cellular telephones, television, computers and word processors. As a frame of reference, high-tech is usually clustered in the following fields: computers, electronics, medicine (drugs, bio-engineering, etc.), communication, and aerospace.

Low technology includes aluminum bats, plastic chairs, ball-point and fibre-tipped pens, velcro clothes fasteners (replacing buttons), file systems, MBO, ROI, and tubeless tires. In other words, these areas that would not fit into the high-tech category are considered low technology.

Consider the mix of technologies that assist communication: video-cassette recorders, electronic typewriters, electronic filing, micro-computers, electronic calendars, offset printing, correcting ribbons, word processors, copying machines, modems, micro-lead pencils, and electronic paging systems.

These make a formidable array of high and low technologies to assist the communication function. Since the availability of paper, printing, and television, the communication field has been a major benefactor of technology.

CAN TECHNOLOGY BE MANAGED?

Does technology lead or serve society? Much of the concern over technology resides in this issue. Yes, technology can and must be managed. Alvin Toffler (1970) and Peter Drucker (1968), both eminent analysts and writers on the future of society and organizations, have suggested that advanced technology can be harnessed to deal with new and old problems of society.

The challenge of managing technology takes into account the characteristics of interdependence, complexity, and change involved in that challenge. The type of management must be appropriate to the situation. Cleland and King (1983) suggest a form of technology-base for management which deals with relating management to the effective use of technology and technological innovation.

The "relevant technology" may be knowledge-based in an administrative setting, and science or machine based in the R&D or production setting. This technological understanding infers process

as well as subject awareness. In fact, technological awareness and understanding constitute an area where communication plays a vital role.

Peter Drucker has made some telling observations about the relationship of technology and business/management (1981, p. 37):

> Modern business is, to a very considerable extent, the creature of technology.
>
> Business managers have to learn that technology is managerial opportunity and managerial responsibility.
>
> Technology is no more mysterious or unpredictable than developments in the economy or society.

One other view of managing technology deals with issues of organization and the accompanying communication links. According to Perrow (1970), the management task involves organizational technology in

1. The degree of the complexity of the technology.

2. The dimension of dynamism of the technology.

At the same time, Hickson, Pugh, and Pheysey (1969) present an organization technology typology which relates to the technology of work flow and the attendant communication requirement entailed:

1. Operations technology--the equipping and sequencing of the work flow.

2. Materials technology--characteristics of materials used.

3. Knowledge technology--characteristics of knowledge used in the work flow.

The elaboration of factors in the management of technology is directly linked to the communication activity requiring linkage, coordination, and information for the organization.

All technology continues to improve itself; therefore, the name by which it is known also will change. Television and films are being changed by video-cassette recorders; music is no longer only audio but visual as well. In other words, technology has a growth cycle, and this cycle follows the human rhythms of life. In its infancy, the new tool is given much attention. In its adolescence, its presence cannot be ignored; people have a hard time coping with it. There is encroachment into their lives. In its adult stage, the tool is taken for granted and its absence felt more than its presence. And as with the human cycle, each technological tool will have a death cycle and take on a new form--a newer, more elaborate, more high-tech object will take its place.

To deal and cope with the encroachment of high-tech, perhaps along with demystifying its presence and language, one must develop a personal philosophy on how to deal with it. One may decide to take a systems design approach--that is, to believe that technology will make the world better so that its imposition can be accepted. Or one can take a cybernetics approach to see how technology has positioned itself as a control gauge. Or lastly, one can look at technology in a synergistic manner, coalescing and fusing technology into the human value system--seeing it as a new way to live.

In any event, the important issue is to make consciously a decision on how to view technology, to recognize its existence (it has been here all along), and to assimilate it with the value structure. Remembering the human element, one can accept technology as a challenge.

CONCLUSION

This paper has attempted to discuss technology in the context of a communication understanding of the variables of technology. Rather than to permit technology to remain a misunderstood phenomenon, we have tried to collect sources which would explain the nature, uses, and implications of technology to facilitate its communication, understanding, and use.

After all, communication is a technology itself.

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